ENGINEERING MATHEMATICS

UNIT CODE: ENG/CU/TXP/CC/02/5/A

Relationship to Occupational Standards
This unit addresses the unit of competency: **Apply engineering mathematics**

Duration of Unit: 150 hours

Unit Description
This unit describes the competencies required by a Textile Processing craft person in order to apply algebra, apply trigonometry and hyperbolic functions, apply complex numbers, apply coordinate geometry, apply calculus, solve ordinary differential equations, carry out mensuration, apply power series, apply statistics, apply numerical methods, apply vector theory and apply matrix.

Summary of Learning Outcomes
1. Use concepts of arithmetic in solving work problems
2. Use common formula and algebraic expressions for work
3. Use trigonometry to solve practical engineering problems
4. Perform estimations, measurements and calculations
5. Apply matrices in work
6. Apply vectors in work
7. Collect, organize and interpret statistical data
8. Apply concepts of probability for work
9. Perform commercial calculations

Learning Outcomes, Content and Suggested Assessment Methods

Learning Outcome	Content	Suggested Assessment Methods
1. Use concepts of arithmetic in solving work problems	• Fundamental operations • Addition, • Subtraction, • Multiplication, • Division of positive and negative numbers • Fractions and decimals operations and conversions • Indices • Ratios and proportions • Meaning	• Written tests • Oral questioning • Assignments • Supervised exercises

		• Conversions into percentages • Direct and inverse proportions determination • Use of scientific calculator	
2.	Use formulae and algebraic expressions for work	• Algebraic linear equations • Simultaneous • Quadratic • Linear graphs • Plotting • Interpretation • Applications of linear graphs • Curves of first and second degree • Plotting • Interpretation • Applications	• Written tests • Oral questioning • Assignments • Supervised exercises
3.	Use trigonometry to solve practical work problems	• Meaning of trigonometry • Pythagoras theorem • Trigonometry ratios of angles • Trigonometric identities • Conversion of angles	• Assignments • Oral questioning • Supervised exercises • Written tests
4.	Perform estimations, measurements and calculations of quantities	• Units of measurements and their symbols • Conversion of units of measurement • Calculation of length, width, height, perimeter, area and angles of figures • Measuring tools and equipment • Performing measurements and estimations of quantities	• Assignments • Oral questioning • Practical tests • Observation • Supervised exercises • Written tests
5.	Apply matrices in work	• Meaning of matrix • Types of matrices • Matrix operations • Compatibility • Addition • Subtraction • Multiplication • Determination of inverse of a matrix • Solution of simultaneous equations with two and three unknowns	• Assignments • Supervised exercises • Written tests

		• Applications of matrices	
6.	Collect, organize and interpret statistical data	• Classification of data • Grouped data • Ungrouped data • Data collection • Importance of sampling • Errors in sampling • Types of sampling and their limitations • Tabulation of data • Class intervals • Class boundaries • Frequency tables • Cumulative frequency • Diagrammatic and graphical presentation of data e.g. • Histograms • Frequency polygons • Bar charts • Pie charts • Cumulative frequency curves • Meaning of measures of central tendency • Measures • Properties • Calculation and interpretation of mean, mode and median • Variance and standard deviation	• Assignments • Oral questioning • Supervised exercises • Written tests
7.	Apply vectors in work	• Meaning of vector • Representations of vectors • Operations of vectors • Addition • Subtraction • Scalar and vector products • Determination of angles	• Assignments • Supervised exercises • Written tests
8.	Apply concepts of probability in work	• Meaning of probability	• Written tests

	• Types of probability events	• Assignments
	• Dependent	• Supervised exercises
	• Independent	
	• Mutually exclusive	
	• Laws of probability	
	• Counting techniques	
	• Permutation	
	• Combination	
	• Tree diagrams	
	• Ven diagrams	
9. Perform commercial calculations	• Product pricing	• Oral questioning
	• Average sales determination	• Written tests
	• Stock turnover	• Assignments
	• Calculation of incomes	• Supervised exercises
	• Profit and loss calculations	
	• Salaries	
	• Gross	
	• Net	
	• Wages	
	• Time rate	
	• Flat rate	
	• Overtime	
	• Piece rate	
	• Commission	
	• Percentage	
	• Bonus	
	• Conversion of one currency to another	
	• Exchange rates calculation	
	• Devaluation	
	• Revaluation	

Suggested Methods of Instruction

- Group discussions
- Demonstration by trainer
- Exercises by trainee

Recommended Resources

- Scientific Calculators

- Rulers, pencils, erasers
- Charts with presentations of data
- Graph books
- Dice
- Computers with internet connection